



## **PRELIMINARY SITE ASSESSMENT**

**WILCOHESS (PARCEL #19)  
850 Capital Boulevard  
Raleigh, North Carolina  
State Project: B-5121 & B-5317  
WBS Element: 42263.1.1  
F&R Project #66T-0097**

**August 21, 2015**

**Prepared for:**

**North Carolina Department of Transportation  
Geotechnical Engineering Unit  
1020 Birch Ridge Drive  
Raleigh, NC 27610**



**FROEHLING & ROBERTSON, INC.**

*Engineering Stability Since 1881*

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August 21, 2015

**North Carolina Department of Transportation  
Geotechnical Engineering Unit**  
1020 Birch Ridge Drive  
Raleigh, North Carolina 27610

Attn.: Mr. Terry Fox, L.G.  
GeoEnvironmental Project Manager

**Re:** State Project: B-5121 & B-5317  
WBS Element: 42263.1.1  
BR 277 on US 70/US 401/NC 50 (Capital Blvd.) over Peace Street and  
BR 213 on US 70/NC 50 (Wade Ave.) over US 401 (Capital Blvd.)

**Subject: Preliminary Site Assessment  
Parcel #19 – WilcoHess (WilcoHess #211)**  
850 Capital Blvd  
Raleigh, North Carolina  
F&R Project #66T-0097

Dear Mr. Fox:

Froehling and Robertson, Inc. (F&R) has completed the authorized Preliminary Site Assessment at the WilcoHess property in Raleigh, North Carolina. The work was performed in general accordance with F&R's Proposal No. 1666-00058, dated May 19, 2015. Notice to Proceed was issued to F&R on June 25, 2015. This report documents our field activities, presents the results of laboratory analysis and provides estimated quantities of petroleum impacted soils.

Please do not hesitate to contact us if you should have any questions regarding this report.

Sincerely,

**FROEHLING & ROBERTSON, INC.**

DocuSigned by:  
*Benjamin A. Whitley*  
E425D6E8C23545B...  
Benjamin A. Whitley, P.E.  
Project Engineer



DocuSigned by:  
*Michael Sabodish*  
B4FED45203C345C...  
Michael S. Sabodish, Jr., Ph.D, P.E.  
Engineering and Remediation Services Manager



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**Preliminary Site Assessment Report  
WilcoHess Property (Parcel #19)  
Raleigh, Wake County, North Carolina  
F&R Project No. 66T-0097**

**1.0 Introduction**

Froehling and Robertson, Inc. (F&R) has prepared this Preliminary Site Assessment (PSA) Report to document soil assessment activities performed at the WilcoHess Property addressed as 850 Capital Boulevard in Raleigh, Wake County, North Carolina. The site is located on the east side of Capital Boulevard, approximately 1,500 feet north of West Peace Street, as shown in Appendix I, Figures 1 and 2. As indicated in the Request for Technical and Cost Proposal (RFTCP), the property currently operates as WilcoHess #211. According to the NCDENR UST Section Registry, three (3) USTs are currently in use at the site. Seven USTs were removed in 1993. A remediation system is located on the north side of the building, and monitoring and recovery wells are located within the proposed easement.

The PSA was performed in general accordance with F&R's Proposal No. 1666-00058, dated May 19, 2015 with Notice to Proceed issued to F&R by the NCDOT on June 25, 2015. The purpose of this report is to document field activities, present the results of laboratory analysis, and provide estimated quantities of petroleum impacted soils.

As outlined by the NCDOT in their RFTCP, acquisition of right-of-way is necessary for the Peace Street Bridge, Wade Avenue Bridge and Capital Boulevard improvements in Raleigh (See Figure No. 3). As such, the NCDOT requested a PSA be performed to assess the possibility of encountering petroleum impacted soil from known or unknown USTs which may exist/existed at the project site.

The existing on-site building is one-story in height and is constructed of brick with steel framing. A canopy with six pump islands is also located on the site. The remainder of the site consists of asphalt and concrete paved parking areas. Access to the site is gained from Capital Boulevard to the west. The site is bordered to the north by an access drive leading to railroad tracks bordering the property to the east; to the south by a U-Haul facility; and to the west by Capital Boulevard. Photos detailing existing site features are attached as Appendix IV of this report.



## **2.0 Geophysical Survey**

Prior to F&R's soil assessment activities, Pyramid Environmental & Engineering, P.C. (Pyramid) conducted a geophysical survey to locate suspect metal underground storage tanks (USTs). The geophysical work was conducted from June 26 to July 1, 2015, and was performed within the proposed right-of-way.

The geophysical investigation consisted of electromagnetic (EM) induction surveys using a Geonics EM61 instrument. Ground-penetrating radar (GPR) investigations of selected EM61 anomalies were investigated using a Geophysical Survey Systems UtilityScan DF unit equipped with a dual frequency 300/800 MHz antenna. The EM61 data was collected along parallel survey lines spaced approximately five feet apart. The data was reviewed in the field to evaluate the possible presence of USTs and later transferred to a desktop computer for further review. Data was collected over most of the planned survey site with the exception of the building footprint and areas immediately adjacent to metallic objects and other obstacles (such as vehicles). Isolated EM anomalies were identified on the site, including utilities, monitoring well caps, reinforced concrete and posts. These EM anomalies were directly attributable to visible features on the site; therefore, a GPR survey was not performed.

Based on the EM data collected at the site, Pyramid did not observe anomalies that were interpreted to be the results of metallic USTs within about 6 feet of the ground surface. The complete geophysical report is attached as Appendix II.

## **3.0 Site Assessment Activities**

F&R visited the site on July 23, 2015 to perform the Preliminary Site Assessment. The assessment consisted of advancing 5 borings into the soils at the project site using direct-push technology (Geoprobe). The borings (B-1 through B-5) were generally located on the western portion of the site, within approximately 25 feet of the existing edge of pavement on Capital Boulevard (Appendix I, Figure 3). Boring locations were determined by F&R staff based on the results of the geophysical survey, site features and proposed construction activities. The borings were generally advanced to the proposed depth of 10 feet bgs. However, Boring B-1 was terminated at 7 feet bgs, where Geoprobe refusal was encountered due to very dense sands.

Soil sample cores from the borings were collected in disposable, 4-foot long acetate sleeves. The soil samples were visually/manually classified and screened in the field using a photo-ionization detector (PID) for evidence of petroleum hydrocarbons. Evaluation of VOC



concentrations were performed using a MiniRae 2000 PID which produces results in parts per million (ppm). A representative soil sample was collected from one foot sections of each sleeve and placed in a re-sealable plastic bag. The vapors were then allowed to equilibrate in the headspace of the bag for approximately ten minutes prior to measurement with the PID. The measurements were collected by placing the probe tip into the headspace of the bag. PID measurements can be found in the Geoprobe Logs in Appendix III, as well as in Table 1 in Section 5.0 below.

The soil sample which exhibited the highest PID concentration or the sample at boring termination was submitted for laboratory analysis for diesel range organics (DRO), gasoline range organics (GRO), Total BTEX (benzene, toluene, ethylbenzene and xylenes), 16 PAHs (polycyclic aromatic hydrocarbons) and BaP (Benzo(a)pyrene) by Ultraviolet Fluorescence (UVF) technology (QROS QED Hydrocarbon Analyzer).

The samples were collected in laboratory-supplied sample containers, placed in a cooler with ice, and shipped via UPS to QROS in Wilmington, North Carolina following standard chain-of-custody procedures.

#### **4.0 Subsurface Conditions**

As indicated in the attached Geoprobe Logs (Appendix III), subsurface conditions from existing ground surface to boring termination primarily included various layers of moist, tan to gray fine to coarse sand (USCS – SW/SP), orange-tan to tan-gray silty fine to coarse sand (USCS – SM) and orange-tan to red-tan sandy clay (USCS – CL). The borings were generally terminated at the proposed depth of 10 feet bgs; however, Boring B-1 was terminated at approximately 7 feet bgs in a layer of very dense sand.

F&R noted petroleum odors at the following depths:

- Boring B-2, from 3 to 10 feet bgs;
- Boring B-3, from 2 to 10 feet bgs;
- Boring B-4, from 6 to 10 feet bgs; and
- Boring B-5, from 6 to 10 feet bgs.

Groundwater was not observed during field screening or sample collection activities; however, wet soils were observed in Borings B-3 and B-4 from 4 to 8 feet bgs, which may be due to perched water.



Of the samples screened, PID readings generally did not exceed 1.0 ppm; however, elevated readings were obtained in Borings B-3 (from 3 to 10 feet bgs), B-4 (from 6 to 10 feet bgs), and B-5 (from 6 to 10 feet bgs).

## 5.0 Analytical Results

As shown in the following table, petroleum hydrocarbons identified as DRO were encountered in the soil samples collected at the five boring locations advanced at the site (B-1 through B-5), at depths from 5 feet bgs (B-1) to 9 feet bgs (B-2 and B-5). The laboratory results indicate that the DRO concentrations ranged from < 2.8 mg/kg (B-3) to 297.5 mg/kg (B-4). DRO concentrations above the NCDENR Action Level of 10 mg/kg were detected in four of the samples submitted.

In addition, GRO was detected in the samples obtained from Borings B-2, B-4 and B-5, ranging in concentration from 161.5 to 556.4 mg/kg, above the NCDENR Action Level of 10 mg/kg.

The laboratory analytical results indicate concentrations of the Sum of 16 PAHs above the method detection limit, but below the NCDENR Action Level of 7,041.14 mg/kg in the four of the samples submitted. In addition, Benzo (a) pyrene (BaP) was detected in four of the samples submitted. BaP was detected at a concentration of 0.13 in the sample collected from B-4, which is above the NCDENR Soil-to-Water MSCC or 0.096 mg/kg.

The soil analytical results are summarized in Table 1 below. The laboratory analytical results can also be found in the attached Appendix V of this report.

**Table 1**  
**Soil Sampling Analytical Results**

Sample ID	Sample Date	Sample Depth (ft bgs)	PID Reading (ppm)	GRO (mg/kg)	DRO (mg/kg)	TPH (mg/kg)	Total BTEX (mg/kg)	Total Aromatics (mg/kg)	16 EPA PAHs (mg/kg)	BaP (mg/kg)
B-1	7/23/15	5-6	0.4	< 6.9	<b>241.9</b>	<b>241.9</b>	< 13.7	136	5.2	0.071
B-2		8-9	1,192	<b>161.5</b>	<b>84.7</b>	<b>246.2</b>	< 14.4	42.4	1.6	< 0.14
B-3		6-8	854	< 6.9	< 2.8	< 6.9	< 6.9	< 1.4	< 0.28	< 0.14
B-4		6-8	470	<b>556.4</b>	<b>297.5</b>	<b>853.9</b>	< 12.8	133.6	5.2	<b>0.13</b>
B-5		8-9	816	<b>220.2</b>	<b>192.3</b>	<b>412.5</b>	< 1.4	151.7	6	0.033
<b>NC DENR Action Level</b>				<b>10</b>	<b>10</b>	<b>10</b>	<b>13.8</b>	<b>NSE</b>	<b>7,041.41</b>	<b>0.096</b>

Samples shown in bold exceed the NCDENR Action Level as outlined in the NCDENR, DWM, UST Section Guidelines  
 ppm = parts per million  
 GRO = Gasoline Range Organics  
 DRO = Diesel Range Organics  
 TPH = Total Petroleum Hydrocarbons  
 BTEX = Benzene, Toluene, Ethylbenzene and Xylenes  
 NSE = No Standard Exists



## 6.0 Conclusions and Recommendations

F&R conducted a PSA at the WilcoHess Property located at 850 Capital Boulevard in Raleigh, Wake County, North Carolina. A geophysical investigation was performed by Pyramid Environmental & Engineering to investigate the existence of unknown/known USTs in the proposed right-of-way. Based on the results of the geophysical survey, it was determined that USTs were not present within the surveyed area.

Five Geoprobe borings were advanced during the assessment within the proposed right-of-way, where grading activities are proposed in association with the Peace Street Bridge, Wade Avenue Bridge and Capital Boulevard improvements. Based on the results of laboratory testing and observed PID readings, petroleum impacted soils were found at concentrations above the NCDENR Action Level of 10 mg/kg within the areas evaluated. Therefore, it is estimated that petroleum impacted soils, at concentrations above the NCDENR Action Level, are present from existing ground surface to a depth of at least nine feet below existing ground surface in the vicinity of Borings B-1 through B-5.

No below grade utilities appear on the proposed improvement plans. However, reconstruction of the curblines and driveways is depicted, which will likely require re-grading of the existing ground surface during the construction. For the purpose of this assessment, we have estimated an average petroleum-impacted area of 6,053.6 square feet, extending to a depth of nine feet bgs. This area accounts for impacted soils that may be generated during re-grading activities and for unknown below grade utilities that may be installed during construction. The area was determined by averaging distances between the proposed right-of-way and the proposed edge of pavement on the construction drawings (Appendix I, Figure 4).

**Table 2**  
**Approximate Volume of Petroleum Impacted Soil**

Excavation Location (As Shown on Figure 4)	L x W x D (feet)	Soil Volume (cubic feet)	Soil Volume (tons)
Vicinity of B-1 through B-5	L x W varies (6,053.6 SF) X 9' depth	54,482.4	3,268.9
<b>Soil Volume (assuming a soil density of 120 pcf)</b>		<b>Total</b>	<b>3,268.9</b>





It should be noted that a delineation of the soil contamination was not performed, as this was not included in the proposed scope of work. The above estimates are based on interpretations of soil analytical results, PID readings and our experience with petroleum UST releases. In order to generate estimated quantities of petroleum impacted soils, we have inferred that the contamination has occurred between the existing ground surface and the sample collection depth. The amount of impacted soil can only be determined after excavation or by advancing additional borings and performing additional laboratory analysis to delineate the extents (horizontal and vertical) of contamination.

## **7.0 Limitations**

These services have been performed, under authorization of the North Carolina Department of Transportation for specific application on this project. These services have been performed in accordance with generally accepted environmental and hydrogeological practices. No other warranty, expressed or implied is made. As with any subsurface investigation, actual conditions exist only at the precise locations from which samples were taken. Certain inferences are based on the results of sampling and related testing to form a professional opinion of conditions in areas beyond those from which samples were taken. Our conclusions and recommendations are based upon information provided to us by others, our sampling and testing results and our site observations. We have not verified the completeness or accuracy of the information provided by others, unless otherwise noted. Our observations are based upon conditions readily visible at the site at the time of our site visits.

Froehling & Robertson, Inc. by virtue of providing the services described in this report, does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state or federal public agencies any conditions at the site that may present a potential danger to public health, safety or the environment. In areas that require notification of local, state, or federal public agencies as required by law, it is the Client's responsibility to so notify.



## **APPENDIX I**

**Figure No. 1 – SITE VICINITY MAP**

**Figure No. 2 – TOPOGRAPHIC MAP**

**Figure No. 3 – LABORATORY RESULTS & BORING LOCATION PLAN**

**Figure No. 4 – ESTIMATED EXTENTS OF SOIL CONTAMINATION**

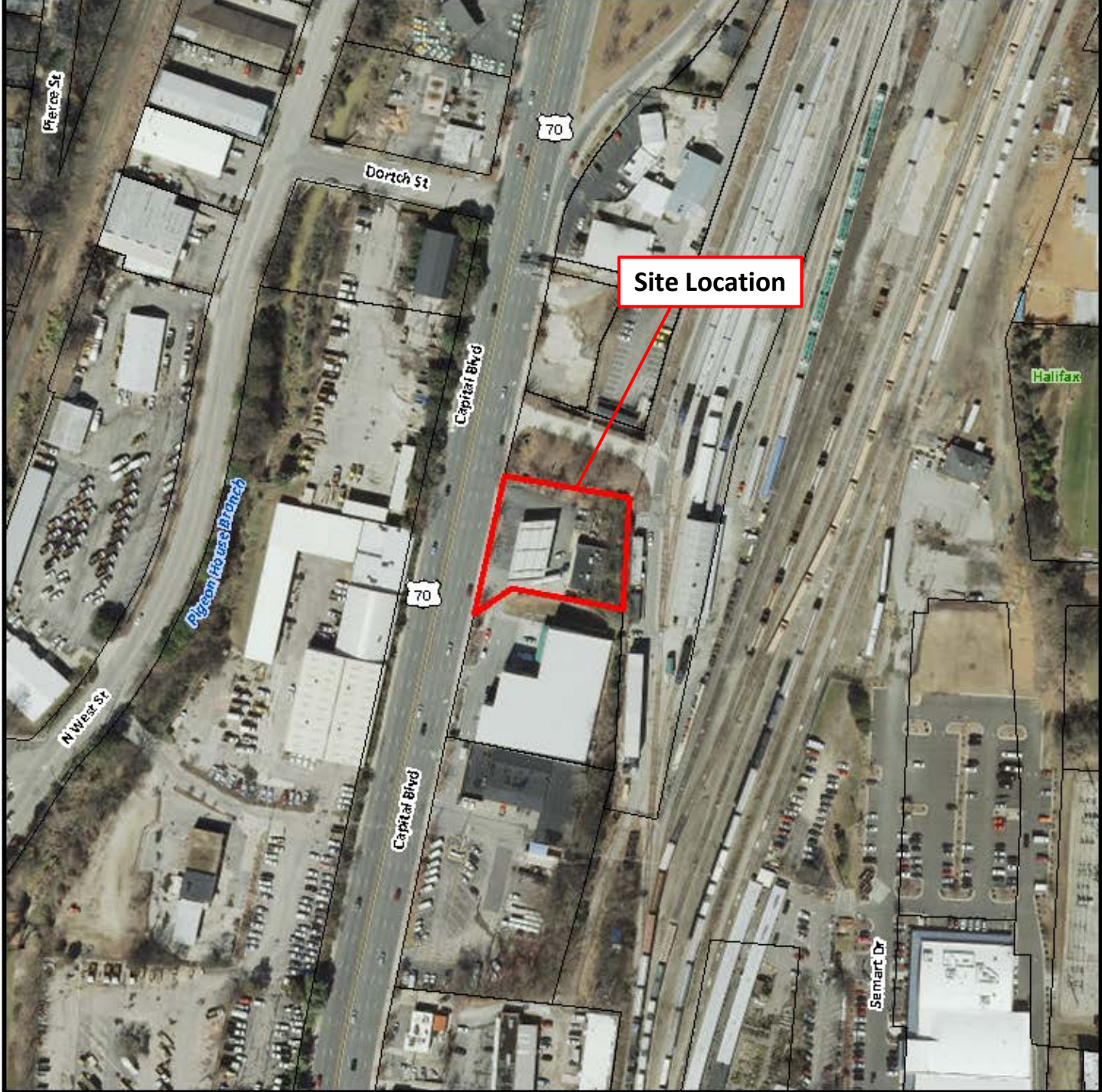
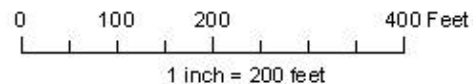


Image Courtesy of Wake County iMaps



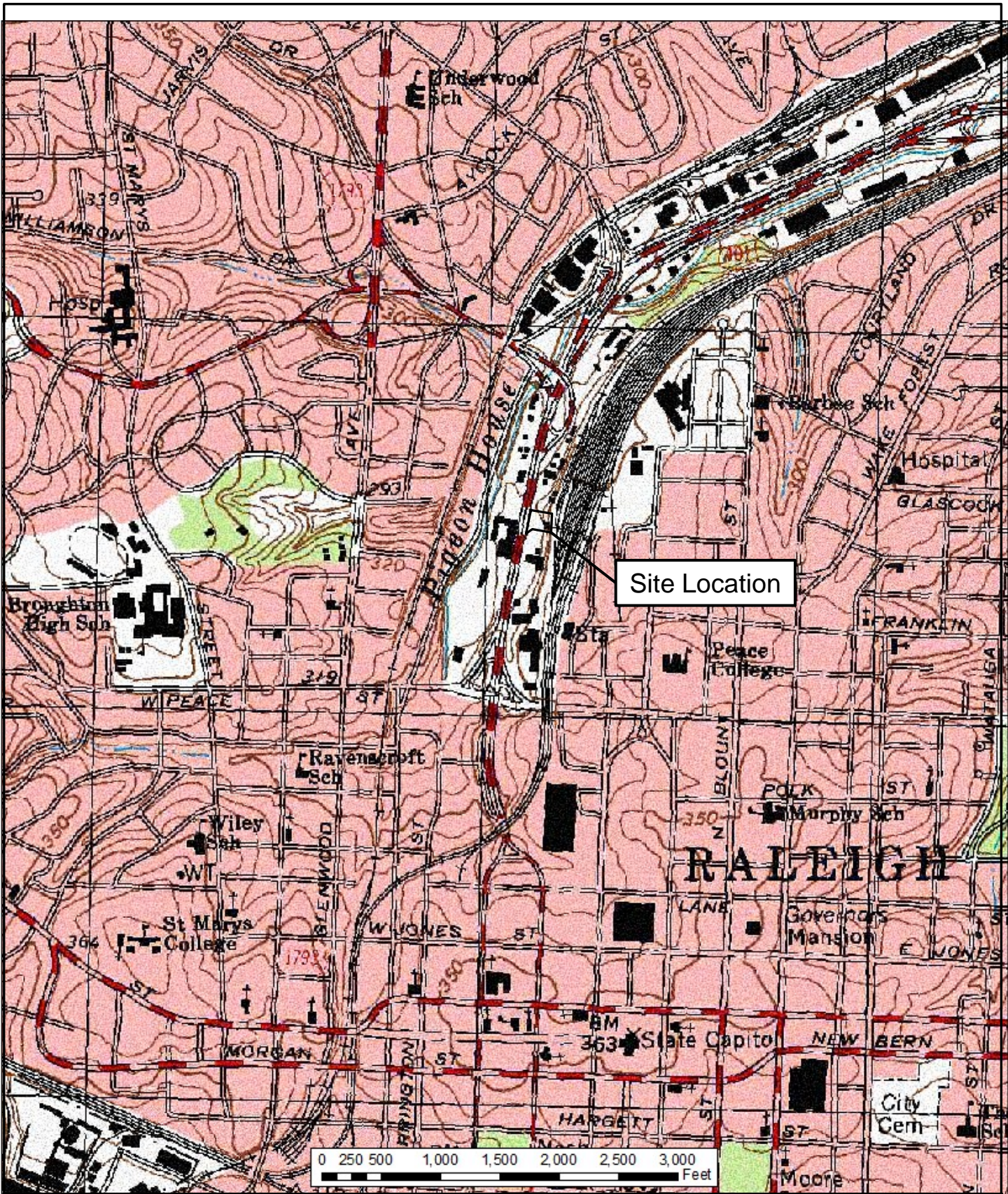
**SITE VICINITY MAP**

**North** ▲



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CLIENT: NCDOT		FIGURE No.: <b>1</b>
PROJECT: B-5121 & B-5317, WilcoHess Property, NCDOT Parcel #19		
LOCATION: Raleigh, Wake County, North Carolina		
F&R PROJECT No.: 66T-0097		
DRAWN BY: B. Whitley		
DATE: August 2015	SCALE: 1" = 200'	



**TOPOGRAPHIC MAP – RALEIGH, NC**

North



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CLIENT: NCDOT

PROJECT: : B-5121 & B-5317, WilcoHess Property, NCDOT Parcel #19

LOCATION: Raleigh, Wake County, North Carolina

F&R PROJECT No.: 66T-0097

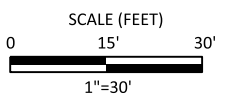
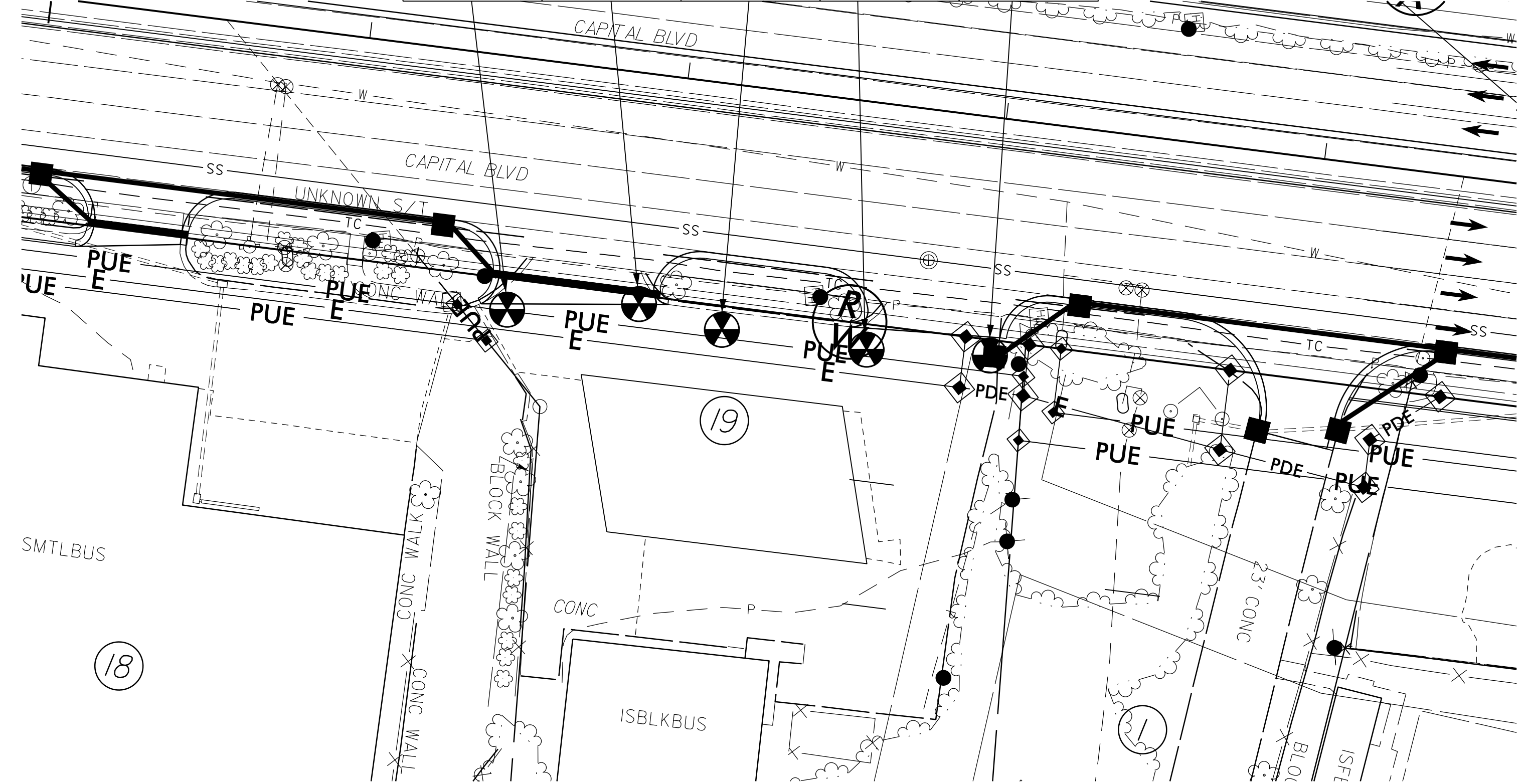
DRAWN BY: B. Whitley

DATE: August 2015

SCALE: As Shown

FIGURE  
No.: 2

B-1: 5.0'-6.0' DRO= 241.9 mg/kg GRO=<6.9 mg/kg TOTAL BTEX=<13.7 mg/kg 16 EPA PAHs= 5.2 mg/kg BaP= 0.071 mg/kg	B-2: 8.0'-9.0' DRO= 84.7 mg/kg GRO= 161.5 mg/kg TOTAL BTEX=<14.4 mg/kg 16 EPA PAHs= 1.6 mg/kg BaP=<0.14 mg/kg	B-3: 6.0'-8.0' DRO= <2.8 mg/kg GRO=<6.9 mg/kg TOTAL BTEX=<6.9 mg/kg 16 EPA PAHs=<0.28 mg/kg BaP=<0.14 mg/kg	B-4: 6.0'-8.0' DRO= 297.5 mg/kg GRO= 556.4 mg/kg TOTAL BTEX=<12.8 mg/kg 16 EPA PAHs= 5.2 mg/kg BaP= 0.13 mg/kg	B-5: 8.0'-9.0' DRO= 192.3 mg/kg GRO= 220.2 mg/kg TOTAL BTEX=<1.4 mg/kg 16 EPA PAHs= 6 mg/kg BaP= 0.033 mg/kg
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NAD 83/NSRS 2007

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**LEGEND**

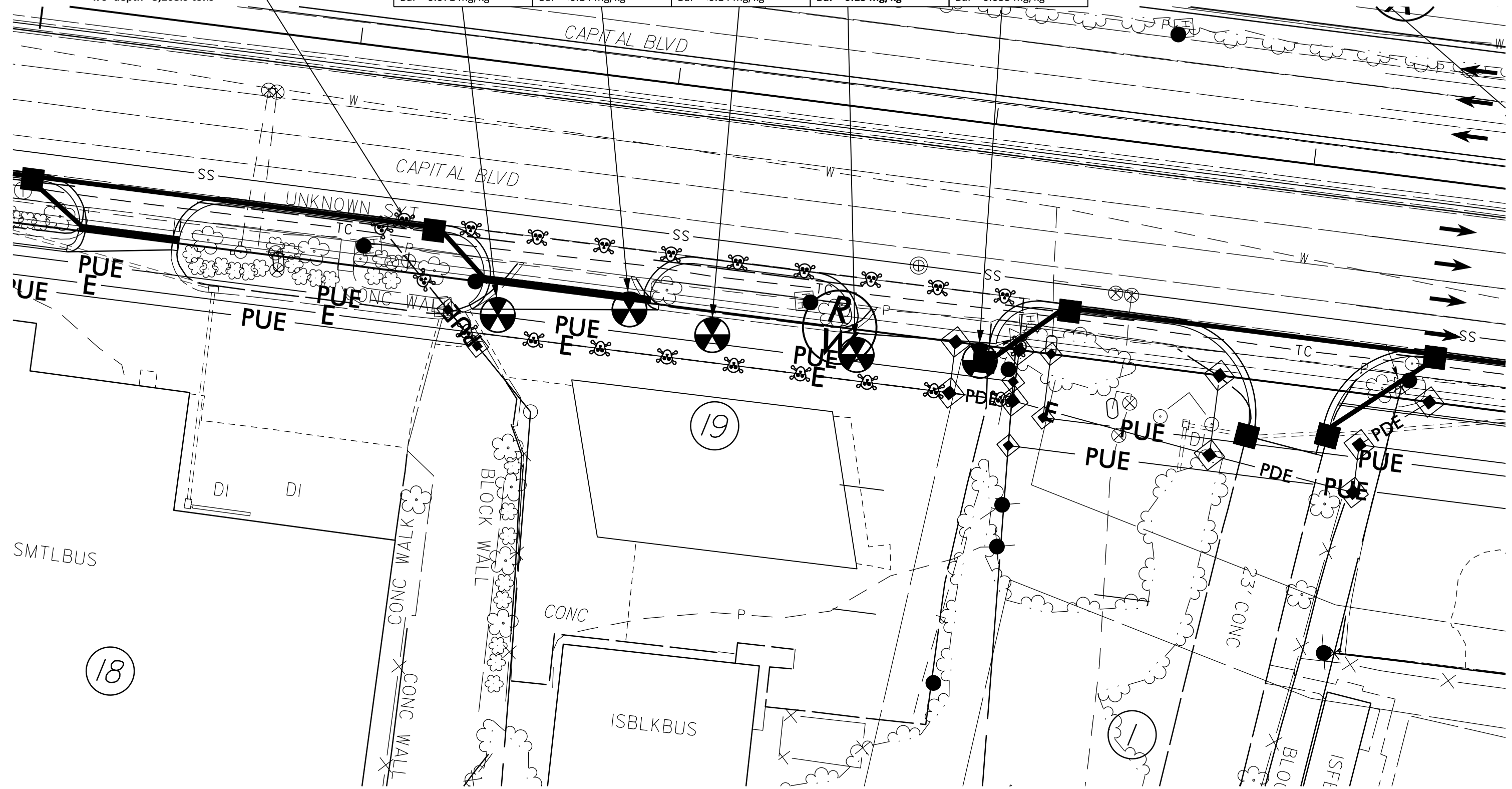
Approximate Geoprobe Boring Location

**Samples Shown in Bold Exceed the NCDENR Action Level as Outlined in the NCDENR, DWM, UST Section Guideline**

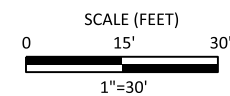
LABORATORY RESULTS & BORING LOCATION PLAN	
CLIENT: NCDOT	
PROJECT: B-5121/B-5317, WilcoHess (Parcel #19)	
LOCATION: Raleigh, Wake County, North Carolina	
F&R PROJECT No.: 66T-0097	
DRAWN BY: T. T. Walker	CHECKED BY: M. Sabodish, P.E.
DATE: August 2015	SCALE: 1"=30'
FIGURE No.:	<b>3</b>

**Estimated Extents of Soil Contamination**  
 L x W varies (6,053.6 SF)  
 x 9' depth= 3,268.9 tons

B-1: 5.0'-6.0' DRO= 241.9 mg/kg GRO=<6.9 mg/kg TOTAL BTEX=<13.7 mg/kg 16 EPA PAHs= 5.2 mg/kg BaP= 0.071 mg/kg	B-2: 8.0'-9.0' DRO= 84.7 mg/kg GRO= 161.5 mg/kg TOTAL BTEX=<14.4 mg/kg 16 EPA PAHs= 1.6 mg/kg BaP=<0.14 mg/kg	B-3: 6.0'-8.0' DRO= <2.8 mg/kg GRO=<6.9 mg/kg TOTAL BTEX=<6.9 mg/kg 16 EPA PAHs=<0.28 mg/kg BaP=<0.14 mg/kg	B-4: 6.0'-8.0' DRO= 297.5 mg/kg GRO= 556.4 mg/kg TOTAL BTEX=<12.8 mg/kg 16 EPA PAHs= 5.2 mg/kg BaP= 0.13 mg/kg	B-5: 8.0'-9.0' DRO= 192.3 mg/kg GRO= 220.2 mg/kg TOTAL BTEX=<1.4 mg/kg 16 EPA PAHs= 6 mg/kg BaP= 0.033 mg/kg
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NAD 83/NSRS 2007



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**LEGEND**

Approximate Geoprobe Boring Location

**Samples Shown in Bold Exceed the NCDENR Action Level as Outlined in the NCDENR, DWM, UST Section Guideline**

ESTIMATED EXTENTS OF SOIL CONTAMINATION	
CLIENT: NCDOT	
PROJECT: B-5121/B-5317, WilcoHess (Parcel #19)	
LOCATION: Raleigh, Wake County, North Carolina	
F&R PROJECT No.: 66T-0097	
DRAWN BY: T. T. Walker	CHECKED BY: M. Sabodish, P.E.
DATE: August 2015	SCALE: 1"=30'
FIGURE No.:	<b>4</b>



**APPENDIX II**

**GEOPHYSICAL REPORT PREPARED BY PYRAMID**



PYRAMID ENVIRONMENTAL & ENGINEERING  
(PROJECT 2015-176)

# GEOPHYSICAL SURVEY

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**METALLIC UST INVESTIGATION:  
PARCEL 19 – WILCOHESS #211  
NCDOT PROJECT B-5121/B5317  
(WBS 42263.1.1)**

850 CAPITAL BLVD., RALEIGH, WAKE COUNTY, NC

JULY 17, 2015

Report prepared for: Michael Sabodish Jr., Ph.D., P.E.  
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C257: GEOLOGY C1251: ENGINEERING



**GEOPHYSICAL INVESTIGATION REPORT**  
**Parcel 19 – WilcoHess #211**  
**Raleigh, Wake County, North Carolina**

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**Figures**

- Figure 1 – Parcel 19 Geophysical Survey Boundaries and Site Photographs
- Figure 2 – Parcel 19 EM61 Results Contour Map

## LIST OF ACRONYMS

CADD .....	Computer Assisted Drafting and Design
DF .....	Dual Frequency
EM.....	Electromagnetic
GPR.....	Ground Penetrating Radar
GPS .....	Global Positioning System
NCDOT.....	North Carolina Department of Transportation
ROW .....	Right-of-Way
SVE.....	Soil Vapor Extraction
UST .....	Underground Storage Tank

## EXECUTIVE SUMMARY

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**Project Description:** Pyramid Environmental conducted a geophysical investigation for Froehling & Robertson (F&R) at Parcel 19, located at 850 Capital Blvd., Raleigh, NC. The survey was part of a North Carolina Department of Transportation (NCDOT) Right-of-Way (ROW) investigation (NCDOT Project B-5121/B-5317). F&R directed Pyramid as to the geophysical survey boundaries at the project site, which were designed to extend from the existing edge of pavement into the proposed ROW line and/or proposed easements, whichever distance was greater. Conducted from June 26 to July 1, 2015, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

**Geophysical Results:** All of the EM anomalies were directly attributed to visible cultural features. For this reason, a GPR survey was not required. Collectively, the geophysical data did not record any evidence of unknown metallic USTs at the property. Three known USTs were located outside of the proposed ROW/easements.

## INTRODUCTION

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Pyramid Environmental conducted a geophysical investigation for Froehling & Robertson (F&R) at Parcel 19, located at 850 Capital Blvd., Raleigh, NC. The survey was part of a North Carolina Department of Transportation (NCDOT) Right-of-Way (ROW) investigation (NCDOT Project B-5121/B-5317). F&R directed Pyramid as to the geophysical survey boundaries at the project site, which were designed to extend from the existing edge of pavement into the proposed ROW line and/or proposed easements, whichever distance was greater. Conducted from June 26 to July 1, 2015, the geophysical investigation was performed to determine if unknown, metallic underground storage tanks (USTs) were present beneath the survey area.

The site included an active gas station with canopy-covered pump islands surrounded by concrete and an asphalt parking areas. The site history provided to F&R by the NCDOT and field observations confirmed there are three known USTs currently in use along the southeast side of the canopy. These USTs are located outside of the proposed ROW line and proposed easement. Aerial photographs showing the survey area boundaries and ground-level photographs are shown in **Figure 1**.

## FIELD METHODOLOGY

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The geophysical investigation consisted of an electromagnetic (EM) induction-metal detection survey. Pyramid collected the EM data using a Geonics EM61 metal detector integrated with a Trimble AG-114 GPS antenna. The integrated GPS system allows the location of the instrument to be recorded in real-time during data collection, resulting in an EM data set that geo-referenced and can be overlain on aerial photographs and CADD drawings. A boundary grid was established around the perimeter of the site with marks every 10 feet to maintain orientation of the instrument throughout the survey and assure complete coverage of the area.

According to the instrument specifications, the EM61 can detect a metal drum down to a maximum depth of approximately 8 feet. Smaller objects (1-foot or less in size) can be detected to a maximum depth of 4 to 5 feet. The EM61 data were digitally collected at approximately 0.8 foot intervals along north-south trending or east-west trending, generally parallel survey lines spaced five feet apart. The data were downloaded to a computer and reviewed in the field and office using the Geonics NAV61 and Surfer for Windows Version 11.0 software programs.

GPR data were not required for this parcel due to all EM anomalies being directly attributed to visible cultural features at the ground surface (see discussion below).

Pyramid’s classifications of USTs for the purposes of this report are based directly on the geophysical UST ratings provided to us by the NCDOT. These ratings are as follows:

Geophysical Surveys for Underground Storage Tanks on NCDOT Projects			
High Confidence	Intermediate Confidence	Low Confidence	No Confidence
<b>Known UST</b> Active tank - spatial location, orientation, and approximate depth determined by geophysics.	<b>Probable UST</b> Sufficient geophysical data from both magnetic and radar surveys that is characteristic of a tank. Interpretation may be supported by physical evidence such as fill/vent pipe, metal cover plate, asphalt/concrete patch, etc.	<b>Possible UST</b> Sufficient geophysical data from either magnetic or radar surveys that is characteristic of a tank. Additional data is not sufficient enough to confirm or deny the presence of a UST.	Anomaly noted but not characteristic of a UST. Should be noted in the text and may be called out in the figures at the geophysicist’s discretion.

## DISCUSSION OF RESULTS

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### *Discussion of EM Results*

A contour plot of the EM61 results obtained across the survey area at the property is presented in **Figure 2**. Each EM anomaly is numbered for reference to the figure. The following table presents the list of EM anomalies and the cause of the metallic response, if known:

**LIST OF METALLIC ANOMALIES IDENTIFIED BY EM SURVEY**

<b>Metallic Anomaly #</b>	<b>Cause of Anomaly</b>	<b>Investigated with GPR</b>
1	Recovery Wells	
2	Water Meter/Light Post	
3	Metal Panel	
4	Monitoring Well	
5	Recovery Well	
6	Cut Posts	
7	Light Pole	
8	Recovery Well	
9	Monitoring Well	
10	Reinforced Concrete	
11	Monitoring Well	
12	Cut Posts	
13	Water Meter	
14	Sign/Monitoring Well/Recovery Well	

All of the EM anomalies detected during the survey were directly attributed to a variety of visible cultural features at the ground surface. Specifically, a large number of monitor wells and recovery wells were located throughout the survey area, and each of the metal well caps/covers resulted in multiple EM anomalies. Additionally, features such as light poles, utilities, posts, and reinforced concrete near the pump islands resulted in the remaining EM features. A GPR survey was not required due to all EM features being directly attributed to these cultural objects/structures.

Collectively, the geophysical data did not record any evidence of unknown metallic USTs at the property. Three known USTs were located outside of the proposed ROW/easement.

## SUMMARY & CONCLUSIONS

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Our evaluation of the EM61 and GPR data collected at Parcel 19 in Raleigh, Wake County, North Carolina, provides the following summary and conclusions:

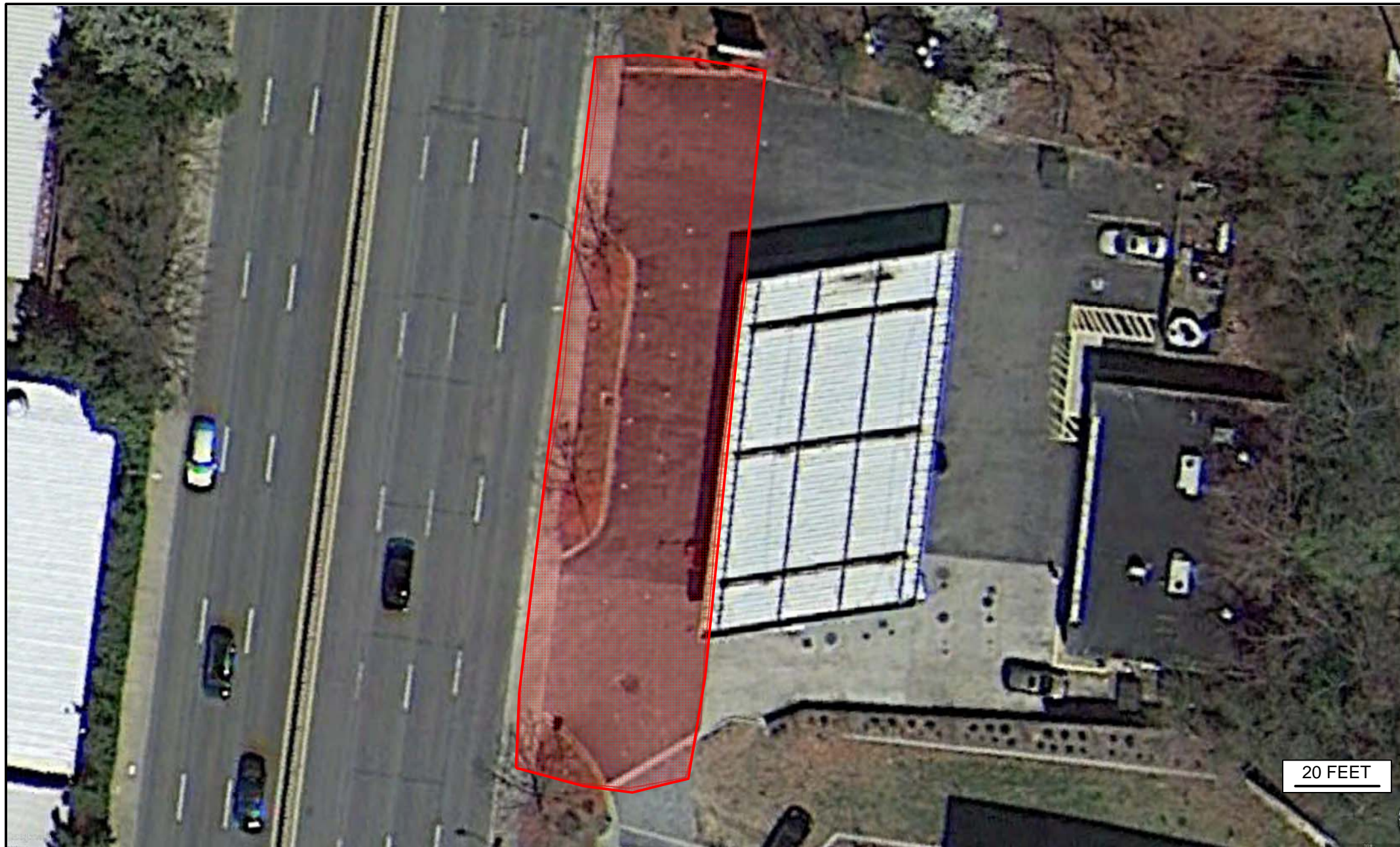
- The EM61 and GPR surveys provided reliable results for the detection of metallic USTs within the accessible portions of the geophysical survey area.
- All of the EM anomalies were directly attributed to visible cultural features. For this reason, a GPR survey was not required.
- Collectively, the geophysical data did not record any evidence of unknown metallic USTs at the property. Three known USTs were located outside of the proposed ROW/easements.

## LIMITATIONS

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Geophysical surveys have been performed and this report prepared for F&R in accordance with generally accepted guidelines for EM61 and GPR surveys. It is generally recognized that the results of the EM61 and GPR surveys are non-unique and may not represent actual subsurface conditions. The EM61 and GPR results obtained for this project have not conclusively determined the definitive presence or absence of metallic USTs, but that the evidence collected is sufficient to result in the conclusions made in this report. Additionally, it should be understood that areas containing extensive vegetation, reinforced concrete, or other restrictions to the accessibility of the geophysical instruments could not be fully investigated.

N ↑




APPROXIMATE BOUNDARIES OF GEOPHYSICAL SURVEY AREA



View of Survey Area  
(Facing Approximately Northeast)



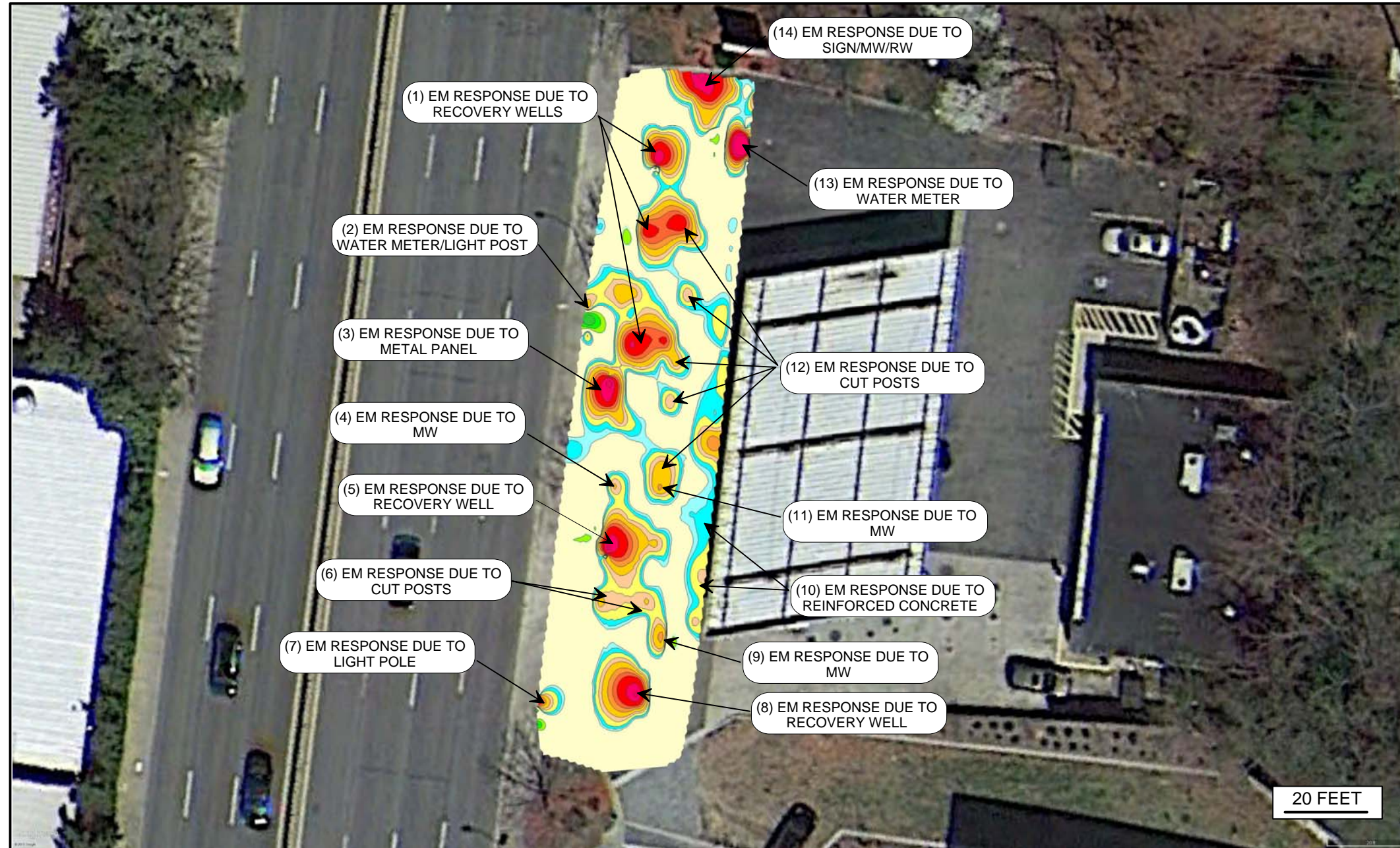
View of Survey Area  
(Facing Approximately North)

TITLE	PARCEL 19 - 850 CAPITAL BLVD. GEOPHYSICAL SURVEY BOUNDARIES AND SITE PHOTOGRAPHS	
PROJECT	METALLIC UST INVESTIGATION NCDOT B-5121/B-5317, RALEIGH, NC	
	 503 INDUSTRIAL AVENUE GREENSBORO, NC 27460 (336) 335-3174 (p) (336) 691-0648 (f) License # C1251 Eng. / License # C257 Geology	
DATE	7/6/2015	CLIENT FROEHLING & ROBERTSON
PYRAMID PROJECT #:	2015-176	<b>FIGURE 1</b>





## Parcel 19 - EM61 Differential Results

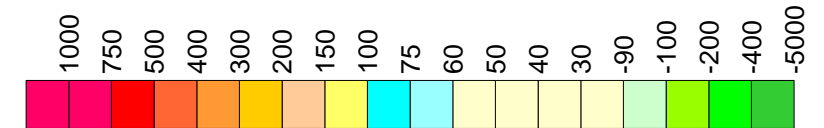



Locations of metallic anomalies detected by the EM61 survey. Numbers correspond to descriptive Table in report.  
 Note: An active UST bed is located to the east, outside of the proposed ROW/Easements.

### NO EVIDENCE OF UNKNOWN METALLIC USTs OBSERVED

The contour plot shows the differential results of the EM61 instrument in millivolts (mV). The EM61 data were collected on June 29, 2015, using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were not required due to all AM anomalies being directly attributed to visible cultural features.

#### EM61 Metal Detection Response (millivolts)



TITLE	PARCEL 19 - 850 CAPITAL BLVD. EM 61 RESULTS CONTOUR MAP	
PROJECT	METALLIC UST INVESTIGATION NCDOT PROJECT B-5121/B-5317 (42263.1.1)	
	 503 INDUSTRIAL AVENUE GREENSBORO, NC 27460 (336) 335-3174 (p) (336) 691-0648 (f) License # C1251 Eng. / License # C257 Geology	
DATE	7/6/2015	CLIENT FROEHLING & ROBERTSON
PYRAMID PROJECT #:	2015-176	<b>FIGURE 2</b>



**APPENDIX III**  
**GEOPROBE LOGS**



**Project No:** 66T-0097

**Elevation:** Existing Ground Surface

**Drilling Method:** Geoprobe

**Client:** NCDOT

**Total Depth:** 7.0'

**Hammer Type:** N/A

**Project:** B-5121/B-5317 WilcoHess (Parcel #19)

**Boring Location:** See Plan

**Date Drilled:** 7/23/15

**City/State:** Raleigh, NC

**Driller:** Regional Probing Services

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
	0.2	Asphalt	0.0	0.2	Petroleum Odors not Observed in Boring
		Moist, Orange-Tan, Sandy CLAY (CL)	1.0	0.3	
	2.0	Moist, Tan, Medium to Coarse SAND (SP)	2.0	0.4	
	3.0	Moist, Tan, Fine to Medium SAND (SP)	3.0	0.4	
	4.0		4.0	0.2	
	5.0	Moist, Tan-White, Silty Medium to Coarse SAND (SM)	5.0	0.4*	*Sample Submitted for Laboratory Analysis for TPH, DRO/GRO, Total BTEX, 16 PAHs, and BaP
	6.0		6.0	0.2	
	7.0	Geoprobe Refusal on Very Dense SANDS at 7 feet.	7.0		

GEOPROBE\_LOG\_B5121\_GEOENV\_GEOPROBEBORELOGS\_PARCEL19.GPJ\_F&R.GDT\_8/21/15

\*Geoprobe soil samples were collected by continuous push of a 2 inch ID stainless steel barrel containing a 4 foot long acetate collection sleeve. The 4 foot long soil sample sleeves were cut open and the soil was separated into 1 foot long sample intervals.



**Project No:** 66T-0097

**Elevation:** Existing Ground Surface

**Drilling Method:** Geoprobe

**Client:** NCDOT

**Total Depth:** 10.0'

**Hammer Type:** N/A

**Project:** B-5121/B-5317 WilcoHess (Parcel #19)

**Boring Location:** See Plan

**Date Drilled:** 7/23/15

**City/State:** Raleigh, NC

**Driller:** Regional Probing Services

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
	0.2	Asphalt	0.0	0.2	
		Moist, Orange-Tan, Sandy CLAY (CL)	1.0	0.4	
	2.0	Moist, Orange-Tan, Silty Fine to Medium SAND (SM)	2.0	0.1	
	3.0	Moist, Tan-Gray, Silty Fine to Medium SAND (SM)	3.0	2.2	Petroleum Odor Observed from 3'-10'
			4.0	2.6	
			5.0	3.7	
	6.0	Moist, Tan-Gray, Fine to Medium SAND (SP)	6.0	2.3	
			7.0	9.5	
	8.0	Moist, Gray-White, Silty Fine to Coarse SAND (SM)	8.0	1192*	*Sample Submitted for Laboratory Analysis for TPH, DRO/GRO, Total BTEX, 16 PAHs, and BaP
	9.0	Moist, Gray-White, Silty Fine to Medium SAND (SM)	9.0	170	
	10.0	Geoprobe Boring Terminated at 10 feet.	10.0		

GEOPROBE\_LOG\_B5121\_GEOENV\_GEOPROBEBORELOGS\_PARCEL19.GPJ\_F&R.GDT\_8/21/15

\*Geoprobe soil samples were collected by continuous push of a 2 inch ID stainless steel barrel containing a 4 foot long acetate collection sleeve. The 4 foot long soil sample sleeves were cut open and the soil was separated into 1 foot long sample intervals.



**Project No:** 66T-0097

**Elevation:** Existing Ground Surface

**Drilling Method:** Geoprobe

**Client:** NCDOT

**Total Depth:** 10.0'

**Hammer Type:** N/A

**Project:** B-5121/B-5317 WilcoHess (Parcel #19)

**Boring Location:** See Plan

**Date Drilled:** 7/23/15

**City/State:** Raleigh, NC

**Driller:** Regional Probing Services

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
	0.2	Asphalt	0.0	1.0	
	1.0	Moist, Tan, Sandy CLAY (CL)	1.0	0.7	
	2.0	Moist, Tan-Brown, Sandy Silty CLAY with Mica (CL)	2.0	2.2	Petroleum Odor Observed from 2'-6'
	3.0	Moist, Brown-Gray, Sandy Silty CLAY with Mica (CL)	3.0	8.7	
	4.0	Wet, Brown-Gray, Medium to Coarse SAND with Gravel (SP)	4.0	3.7	
	6.0	Wet, Gray, Silty Medium to Coarse SAND with Gravel (SM)	6.0	854*	*Sample Submitted for Laboratory Analysis for TPH, DRO/GRO, Total BTEX, 16 PAHs, and BaP Petroleum Odor Observed from 6'-10'
	8.0	Moist, Gray-White, Fine to Medium SAND (SP)	8.0	511	
	10.0	Geoprobe Boring Terminated at 10 feet.	10.0		

GEOPROBE\_LOG\_B5121\_GEOENV\_GEOPROBEBORELOGS\_PARCEL19.GPJ\_F&R.GDT\_8/21/15

\*Geoprobe soil samples were collected by continuous push of a 2 inch ID stainless steel barrel containing a 4 foot long acetate collection sleeve. The 4 foot long soil sample sleeves were cut open and the soil was separated into 1 foot long sample intervals.



**Project No:** 66T-0097

**Elevation:** Existing Ground Surface

**Drilling Method:** Geoprobe

**Client:** NCDOT

**Total Depth:** 10.0'

**Hammer Type:** N/A

**Project:** B-5121/B-5317 WilcoHess (Parcel #19)

**Boring Location:** See Plan

**Date Drilled:** 7/23/15

**City/State:** Raleigh, NC

**Driller:** Regional Probing Services

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
	0.2	Asphalt	0.0	0.9	
		Moist, Orange-Tan, Silty Sandy CLAY (CL)			
			2.0	1.9	
	4.0	Wet, Gray, Silty Fine to Coarse SAND with Gravel (SM)	4.0	1.1	
			6.0	470*	*Sample Submitted for Laboratory Analysis for TPH, DRO/GRO, Total BTEX, 16 PAHs, and BaP Petroleum Odor Observed from 6'-10'
	6.0	Moist to Wet, Gray, Silty Fine to Medium SAND (SM)	6.0		
			8.0	341	
	8.0	Moist, Gray, Silty Fine to Medium SAND (SM)	8.0		
	10.0	Geoprobe Boring Terminated at 10 feet.	10.0		

GEOPROBE\_LOG\_B5121\_GEOENV\_GEOPROBEBORELOGS\_PARCEL19.GPJ\_F&R.GDT\_8/21/15

\*Geoprobe soil samples were collected by continuous push of a 2 inch ID stainless steel barrel containing a 4 foot long acetate collection sleeve. The 4 foot long soil sample sleeves were cut open and the soil was separated into 1 foot long sample intervals.



**Project No:** 66T-0097

**Elevation:** Existing Ground Surface

**Drilling Method:** Geoprobe

**Client:** NCDOT

**Total Depth:** 10.0'

**Hammer Type:** N/A

**Project:** B-5121/B-5317 WilcoHess (Parcel #19)

**Boring Location:** See Plan

**Date Drilled:** 7/23/15

**City/State:** Raleigh, NC

**Driller:** Regional Probing Services

Elevation	Depth	Description of Materials (Classification)	*Sample Depth (feet)	PID (ppm)	Remarks
	0.2	Asphalt	0.0	0.8	
	1.0	Dry, Orange-Tan, Silty Fine Sandy CLAY (CL)	1.0	1.2	
	2.0	Dry to Moist, Orange-Tan, Silty Fine Sandy CLAY (CL)	2.0	1.1	
	3.0		3.0	0.9	
	4.0		4.0	0.8	
	5.0	Moist, Brown, Silty Fine to Medium CLAY (CL)	5.0	0.9	
	6.0	Moist, Orange-Brown and Tan, Silty Fine to Medium SAND (SM)	6.0	16.3	Petroleum Odor Observed from 6'-10'
	7.0	Moist, Tan-Gray, Silty Fine to Medium SAND (SM)	7.0	200	
	8.0		8.0	816*	*Sample Submitted for Laboratory Analysis for TPH, DRO/GRO, Total BTEX, 16 PAHs, and BaP
	9.0		9.0	612	
	10.0	Geoprobe Boring Terminated at 10 feet.	10.0		

GEOPROBE\_LOG\_B5121\_GEOENV\_GEOPROBEBORELOGS\_PARCEL19.GPJ\_F&R.GDT\_8/21/15

\*Geoprobe soil samples were collected by continuous push of a 2 inch ID stainless steel barrel containing a 4 foot long acetate collection sleeve. The 4 foot long soil sample sleeves were cut open and the soil was separated into 1 foot long sample intervals.



**APPENDIX IV**

**SITE PHOTOS**





**Photo #1:** A view of Borings B-1 and B-2, facing north.



**Photo #2:** A view of Borings B-3 and B-4, facing south



**Photo #3:** Boring locations B-4 and B-5, facing south.



**Photo #4:** A view of boring location B-5, facing north.



**APPENDIX V**

**LABORATORY ANALYTICAL RESULTS**



### Hydrocarbon Analysis Results

**Client:** F & R  
**Address:** Raleigh, NC

**Samples taken** Thursday, July 23, 2015  
**Samples extracted** Thursday, July 23, 2015  
**Samples analysed** Friday, July 24, 2015

**Contact:** Ben Whitley

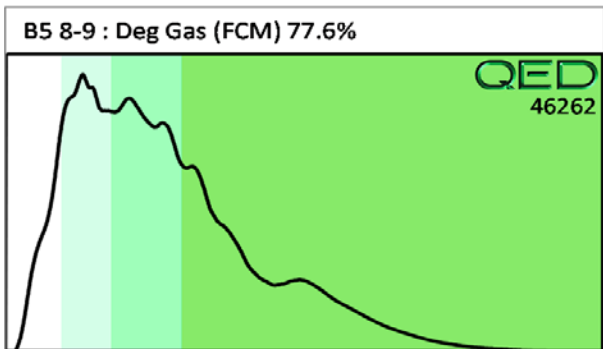
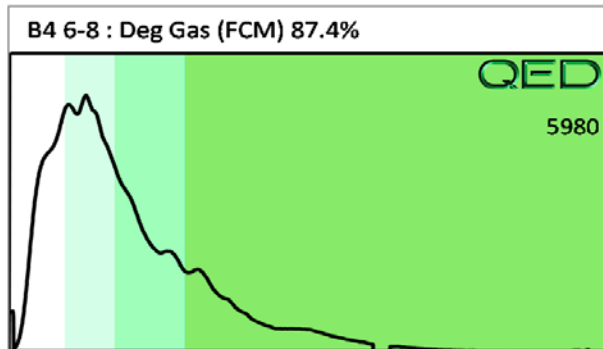
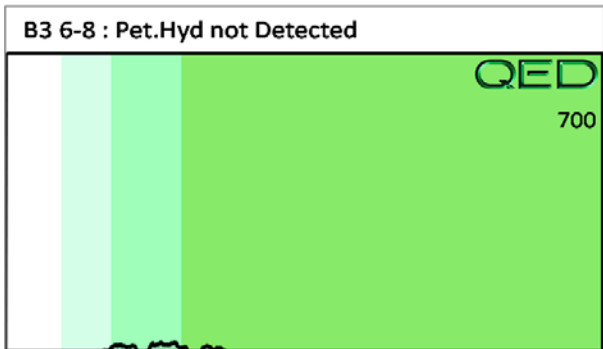
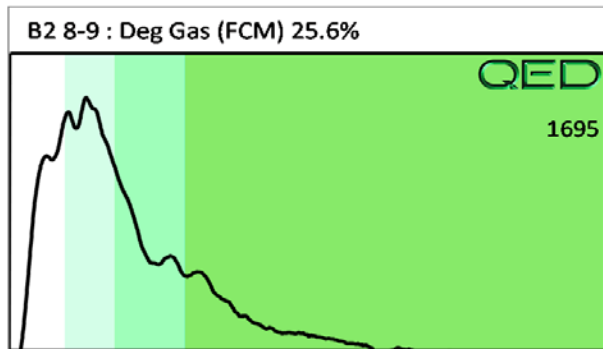
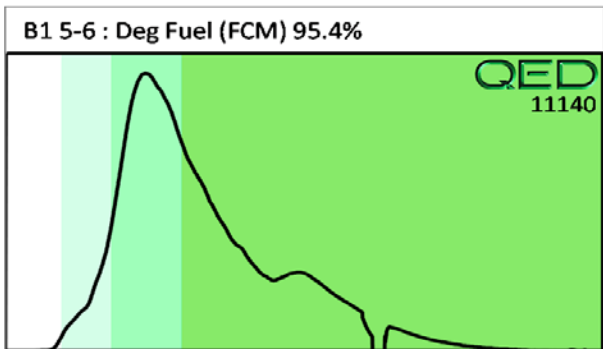
**Operator** F. Owen

**Project:** NC DOT Parcel 19 B-5121/ B-5317

Fingerprints Only													
Matrix	Sample ID	Dilution used	BTEX (C6 - C9)	GRO (C5 - C10)	DRO (C10 - C35)	TPH (C5 - C35)	Total Aromatics (C10-C35)	16 EPA PAHs	BaP	Ratios			HC Fingerprint Match
										% light	% mid	% heavy	
s	B1 5-6	274.8	<13.7	<6.9	241.9	241.9	136	5.2	0.071	0	93.3	6.7	Deg Fuel (FCM) 95.4%
s	B2 8-9	288.9	<14.4	161.5	84.7	246.2	42.4	1.6	<0.14	79.2	20.4	0.3	Deg Gas (FCM) 25.6%
s	B3 6-8	277.0	<6.9	<6.9	<2.8	<6.9	<1.4	<0.28	<0.14	0	0	0	Pet.Hyd not Detected
s	B4 6-8	256.1	<12.8	556.4	297.5	853.9	133.6	5.2	0.13	81	18.7	0.3	Deg Gas (FCM) 87.4%
s	B5 8-9	27.1	<1.4	220.2	192.3	412.5	151.7	6	0.033	63.5	35.1	1.3	Deg Gas (FCM) 77.6%
Initial Calibrator QC check										OK			100.6%
Final FCM QC Check										OK			100.6%

Results generated by a QED HC-1 analyser. Concentration values in mg/kg for soil samples and mg/L for water samples. Soil values are not corrected for moisture or stone content

Fingerprints provide a tentative hydrocarbon identification. The abbreviations are:- FCM = Results calculated using Fundamental Calibration Mode : % = confidence for sample fingerprint match to library (SBS) or (LBS) = Site Specific or Library Background Subtraction applied to result : (PFM) = Poor Fingerprint Match : (T) = Turbid : (P) = Particulate present





## Chain of Custody Record and Analytical Request Form

Sample ID	Sample Collection		Initials	TAT Requested	
	QED UVF	Date		Time	24 Hour
<i>Parcel</i>					
<i>Parcel 16</i> B-1 7-8		7-22-15	1640	BKW	X
B-2 3-4		↓	1650		
B-3 9-10		↓	1705		
B-4 2-4		7-23-15	855		
B-5 8-9			905		
B-6 8-10			920		
B-7 4-5			945		
B-8 5-6			1010		
<i>Parcel 19</i> B-1 5-6			1250		
B-2 4-9			1305		
B-3 6-8			1320		
B-4 6-8			1335		
B-5 8-9			1400		
<i>Parcel 23</i> B-1 4-5			1440		
B-2 5-6			1455		
B-3 4-5			1520		
B-5 6-7			1615		
B-5 9-10			1618		

Client: FER

Contact: Ben Whitley

Phone: 919.630.5061

Email: bwhitley@fandr.com

Project Reference:  
NC DOT B-5121 / B-5317

Each sample will be analyzed for total  
BTEX, GRO, DRO, TPH and PAH

Each sample will generate a fingerprint representative of the petroleum product within the samples. Electronic data will be submitted to the email above.

<u>FER</u>	<u>7-23-15</u>	<u>1800</u>	<u>UPS</u>	<u>7-23-15</u>	<u>1800</u>
Relinquished by	Date/Time		Accepted by	Date/Time	
			<u>[Signature]</u>	<u>7-24-15</u>	<u>10:30</u>
Relinquished by	Date/Time		Accepted by	Date/Time	
Relinquished by	Date/Time		Accepted by	Date/Time	

**SHIP TO:**  
QROS, LLC  
420 Raleigh Street, Suite E  
Wilmington, NC 28412

Hannah King  
[hannahk@grosllc.com](mailto:hannahk@grosllc.com)  
(704)-654-7391

**ATTENTION**

When shipping, please DO NOT submerge sample vials in ice or water. This is to avoid dilution errors and contamination. To keep the samples cool we suggest using a freezer pack or a bag of ice sealed that will not leak.

\* Please send results for Parcels 16, 19, and 23 on separate spreadsheets

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